CLIMATE ANALYSIS CENTER

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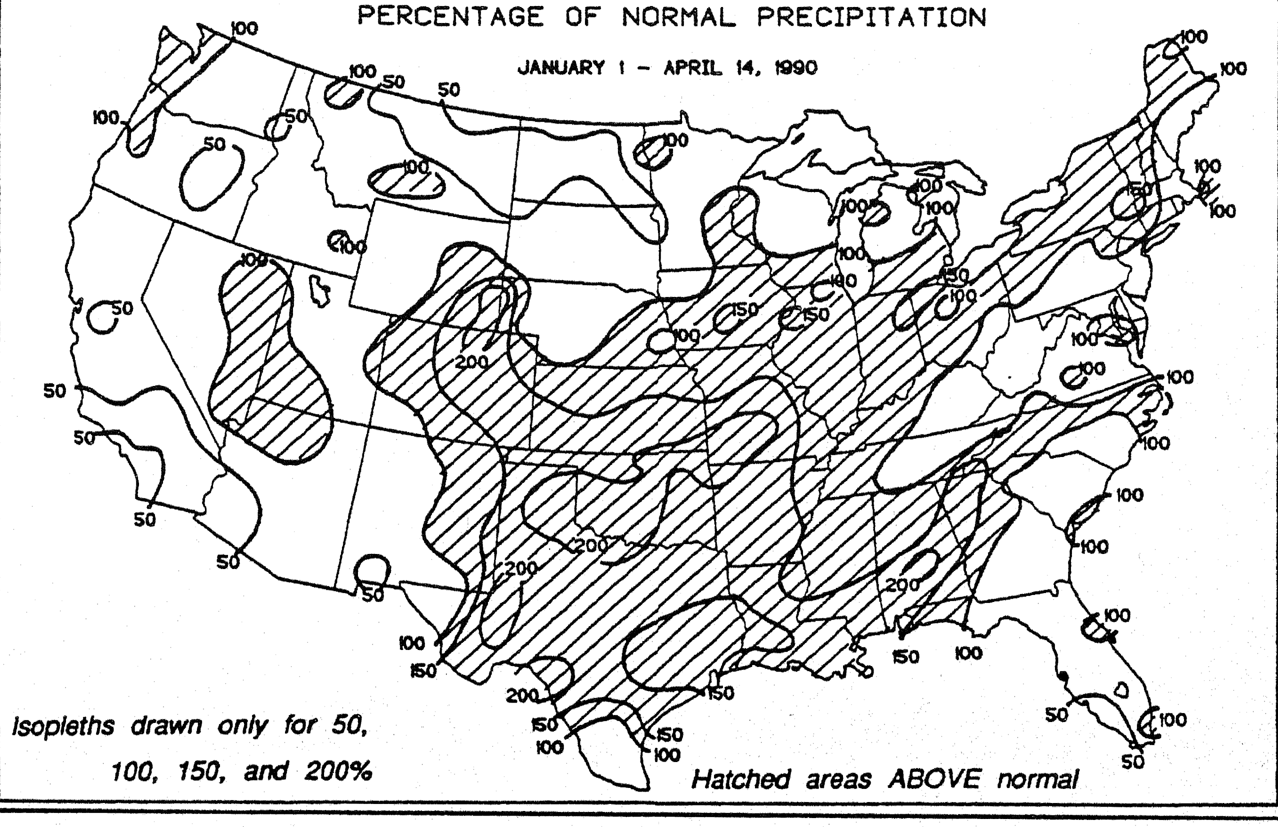
ADVISORY 90/3

WEEKLY CLIMATE BULLETIN

No. 90/15 | **Washington, DC** | **April 14, 1990**

PERCENTAGE OF NORMAL PRECIPITATION

JANUARY 1 - APRIL 14, 1990



THROUGH THE FIRST 3½ MONTHS OF 1990, AMPLE PRECIPITATION HAS FALLEN ON MOST OF THE CENTRAL AND SOUTHERN U.S., KEEPING MUCH OF THE SOUTH–CENTRAL GREAT PLAINS AND THE SOUTHEAST ABNORMALLY MOIST BUT PROVIDING WELCOME RELIEF FROM LONG–TERM DRYNESS IN PARTS OF THE WESTERN CORN BELT, CENTRAL GREAT PLAINS, AND UPPER MIDWEST. FOR ADDITIONAL INFORMATION ON BOTH SHORT AND LONG–TERM MOISTURE CONDITIONS IN THE COUNTRY, REFER TO PAGES 7–8.

UNITED STATES DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE–NATIONAL METEOROLOGICAL CENTER
CLIMATE ANALYSIS CENTER

WEEKLY CLIMATE BULLETIN

This Bulletin is issued weekly by the Climate Analysis Center and is designed to indicate, in a brief concise format, current surface climatic conditions in the United States and around the world. The Bulletin contains:

- *Highlights of major climatic events and anomalies.*
- *U.S. climatic conditions for the previous week.*
- *U.S. apparent temperatures (summer) or wind chill (winter).*
- *U.S. cooling degree days (summer) or heating degree days (winter).*
- *Global two–week temperature anomalies.*
- *Global four–week precipitation anomalies.*
- *Global monthly temperature and precipitation anomalies.*
- *Global three–month precipitation anomalies (once a month).*
- *Global twelve–month precipitation anomalies (every three months).*
- *Global three–month temperature anomalies for winter and summer seasons.*
- *Special climate summaries, explanations, etc. (as appropriate).*

Most analyses contained in this Bulletin are based on preliminary, unchecked data received at the Climate Analysis Center via the Global Telecommunications System. Similar analyses based on final, checked data are likely to differ to some extent from those presented here.

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GLOBAL CLIMATE HIGHLIGHTS

MAJOR CLIMATIC EVENTS AND ANOMALIES AS OF APRIL 14, 1990

1. *Central United States*:

LIGHT TO MODERATE RAINFALL REPORTED.

Heavy thunderstorms, some accompanied by large hail and damaging wind gusts, rumbled through eastern Oklahoma and northeastern Texas, dumping 38 mm to 97 mm across the region. Meanwhile, a period of steady, moderate rain dropped 25 mm to 64 mm on a band from southwestern Missouri northeastward into eastern Ohio. Elsewhere, isolated thundershowers dropped as much as 84 mm on scattered portions of the Deep South, but most areas received little or no rainfall (5 mm to 25 mm) during the week. Despite the recent improvement in conditions, moisture surpluses remain high across the region, and a few more weeks of light to moderate precipitation are necessary before the area is relieved [Ending after 13 weeks].

2. *Northeastern Asia and Western North America*:

EXCEPTIONAL WARMTH PERSISTS.

The excessive warmth across Europe and western Siberia finally eased last week as near seasonal temperatures dominated most areas. Farther east, however, eastern Siberia, Alaska and The Yukon, and the western third of the U.S. reported another week of large positive departures from normal (up to +14°C across the northern tier of Alaska) [7 weeks].

3. *Southern Brazil, Uruguay, Eastern Argentina*:

INUNDATING RAINS ABATE.

Precipitation totals finally diminished across east–central South America. Most of the afflicted area reported only 20 mm to 50 mm of rain, although a small portion of southern Paraguay and southeastern Brazil experienced heavier showers that dropped 50 mm to 150 mm [Ending after 12 weeks].

4. *South–Central and Southeastern Europe*:

WIDESPREAD MODERATE RAINFALL EASES DROUGHT.

Widespread moderate to heavy rain (30 mm to 80 mm) brought relief to much of the afflicted region last week, especially across Greece and western Turkey, where the highest weekly totals in more than three months were measured. Unfortunately, a swath of the stricken region from central Italy to eastern Bulgaria missed most of the beneficial rains, and long–term precipitation deficits remain unfavorably high throughout the area [Ending after 20 weeks].

5. *Western Equatorial Africa*:

SLOW START TO RAINY SEASON.

Typically, thundershower activity begins to increase in frequency and intensity shortly before the vernal equinox along the coastline, spreading inland as the rainy season progresses. This season, however, rainfall has not developed as abundantly as usual, with most locations from Liberia eastward into northern Cameroon measuring 20% to 70% of normal precipitation during the past four weeks. Fortunately, moderate rainfall dampened the region last week, dropping 30 mm to 80 mm along coastal western Equatorial Africa (see front cover) [4 weeks].

6. *Southeastern China*:

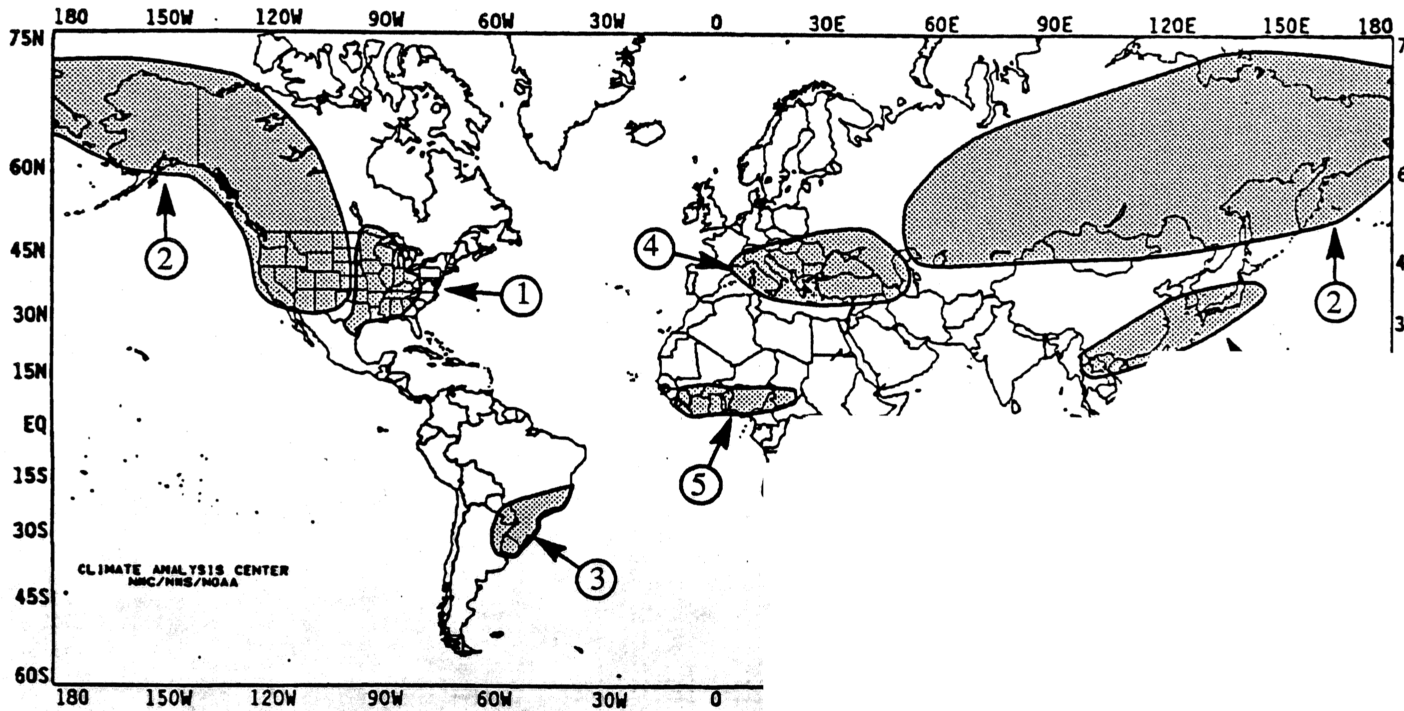
ANOTHER WET WEEK.

Torrential downpours dumped 50 mm to 200 mm of rain across southeastern China while extreme southern portions of Japan recorded nearly 200 mm. In addition, severe weather accompanied some of the precipitation as several showers of hail and one tornado were spawned, according to press reports [3 weeks].

7. *Eastern Australia*:

RAINFALL TOTALS DIMINISH SLIGHTLY.

The out–of–season drenching continued across Queensland, expanding southward to encompass the entire eastern third of the continent last week. Between 60 mm and 150 mm of rain fell across southeastern Australia while 50 mm to 100 mm (representing more than five times the weekly normal at some south–central locations) inundated much of Queensland. Only a small portion of coastal southeastern Queensland reported any relief as only 10 mm to 20 mm moistened those areas [4 weeks].



EXPLANAT

TEXT: Approximate duration of anomalies is in brackets. Precipitation

MAP: Approximate locations of major anomalies and episodic events a temperature anomalies, four week precipitation anomalies, long-

UNITED STATES WEEKLY CLIMATE HIGHLIGHTS

FOR THE WEEK OF APRIL 8 – APRIL 14, 1990

Wintry weather lingered for another week in the north–central and northeastern United States. A late–season snow storm brought up to seven inches of snow to northern Minnesota early in the week, then buried parts of northern Maine under as much as a foot of snow. Later in the week, another storm brought light to moderate snow to northern portions of the Plains and Great Lakes. A heavy, wet snowfall across upper Michigan featured snowflakes two or three inches in diameter.

The two aforementioned disturbances had developed in the nation's midsection, then rapidly intensified as they moved eastward. Ahead of both systems, showers and thunderstorms afflicted parts of the Southeast while more widespread moderate rains dampened a large swath from the east–central Plains to New England. Cold Arctic air was pulled into the eastern two–thirds of the country in the storms' wake, maintaining the abnormally cold weather regime that has afflicted much of the region during the past four weeks. Meanwhile, severe weather outbreaks sporadically developed along each system's trailing cold front, spawning softball–sized hail, hurricane–force wind gusts, and a few tornadoes at isolated locations across Texas and Oklahoma. In addition, heavy thundershowers soaked most of southeastern Florida, providing some relief from the area's long–term drought.

In contrast, a strong ridge of high pressure located along the West Coast kept Pacific Ocean storm systems from entering the area, resulting in warm and dry weather. Alaska also remained dry and extremely mild while seasonable conditions prevailed across Hawaii.

According to River Forecast Centers, the highest weekly precipitation totals were measured in southern Florida (up to 5.1 inches) and across south–central and southeastern Texas (up to 4.5 inches from isolated thundershowers) (see Table 1). Widespread moderate precipitation dropped up to 2.8 inches on a large area from the central Plains northeastward across the middle Mississippi and Ohio Valleys into the Northeast. Meanwhile, heavy showers and thunderstorms dumped as much as 3.8 inches of rain on northeastern Texas and eastern Oklahoma.

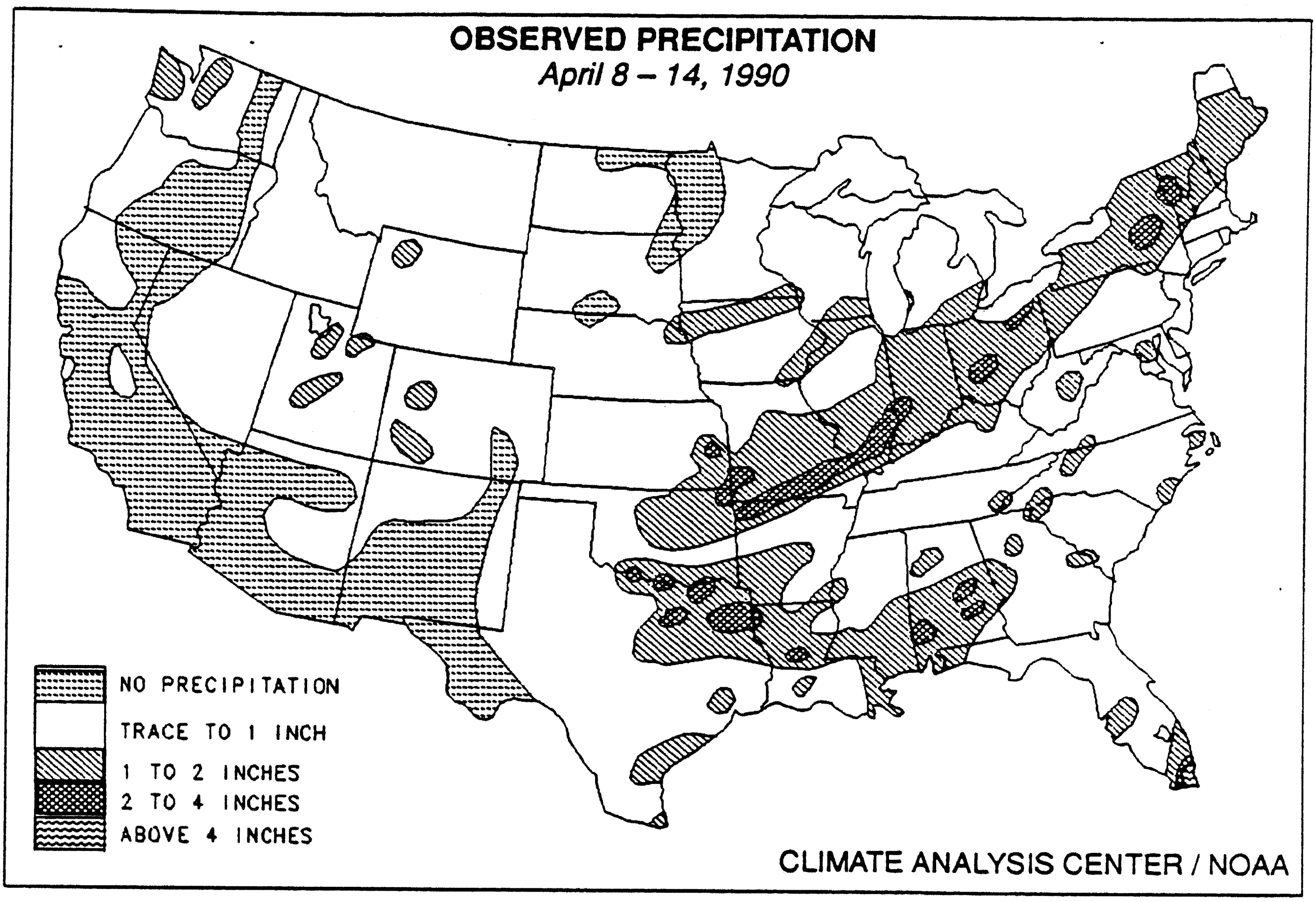
Elsewhere, light to moderate amounts were recorded in western Washington and Oregon, parts of the northern Intermountain West, and most of the central and eastern United States, except for parts of southwestern Florida and along the southern Atlantic Coast. Little or no precipitation fell on the Southwest, most of the Far West, the southern Rockies, and the north–central Plains from Montana to Minnesota.

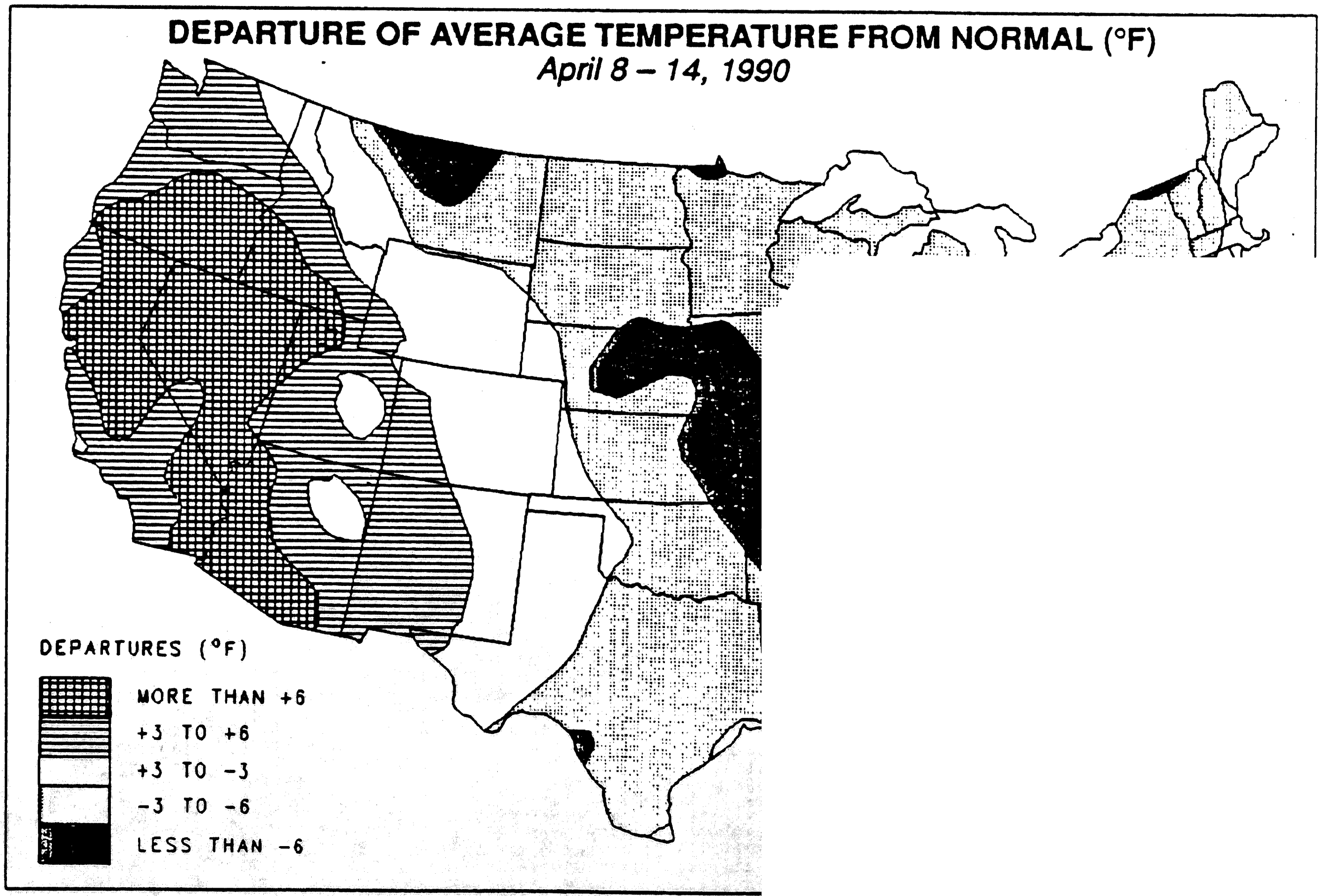
Much of the nation west of the Rockies experienced above normal temperatures for the fourth consecutive week. Temperature departures exceeded +8°F in the Great Basin and the desert Southwest. Temperatures reached into the eighties across much of the West from southern Oregon to Texas (see Figure 1), and about a dozen daily maximum temperatures records were broken during the week. Alaska also observed very mild weather with weekly temperatures averaging as much as 25°F above normal (see Table 2).

The entire country east of the Rockies once again experienced below normal weekly temperatures as cooler than normal conditions have now persisted since mid–March in some areas. A large portions of the central and southeastern United States reported departures less than –6°F (see Table 3). Approximately two dozen daily record lows were reported in the mid–Atlantic and Southeast during the week, and sub–freezing temperatures were recorded as far south as southern Georgia.

TABLE 1. Selected stations with 2.00 or more inches of precipitation for the week.

STATION	TOTAL (INCHES)	STATION	TOTAL (INCHES)
HOMESTEAD AFB, FL	5.09	DALLAS-FORT WORTH, TX	2.16
MIAMI, FL	4.85	BUFFALO, NY	2.14
PALACIOS, TX	2.81	HARRISON, AR	2.14
JOPLIN, MO	2.46	MERIDIAN, MS	2.05
AKRON, OH	2.40	CAPE GIRARDEAU, MO	2.04
CLEVELAND/HOPKINS, OH	2.34		


OBSERVED PRECIPITATION
April 8 – 14, 1990
NO PRECIPITATION
TRACE TO 1 INCH
1 TO 2 INCHES
2 TO 4 INCHES
ABOVE 4 INCHES
CLIMATE ANALYSIS CENTER / NOAA


DEPARTURE OF AVERAGE TEMPERATURE FROM NORMAL (°F)
April 8 – 14, 1990
DEPARTURES (°F)
MORE THAN +6
+3 TO +6
+3 TO -3
-3 TO -6
LESS THAN -6

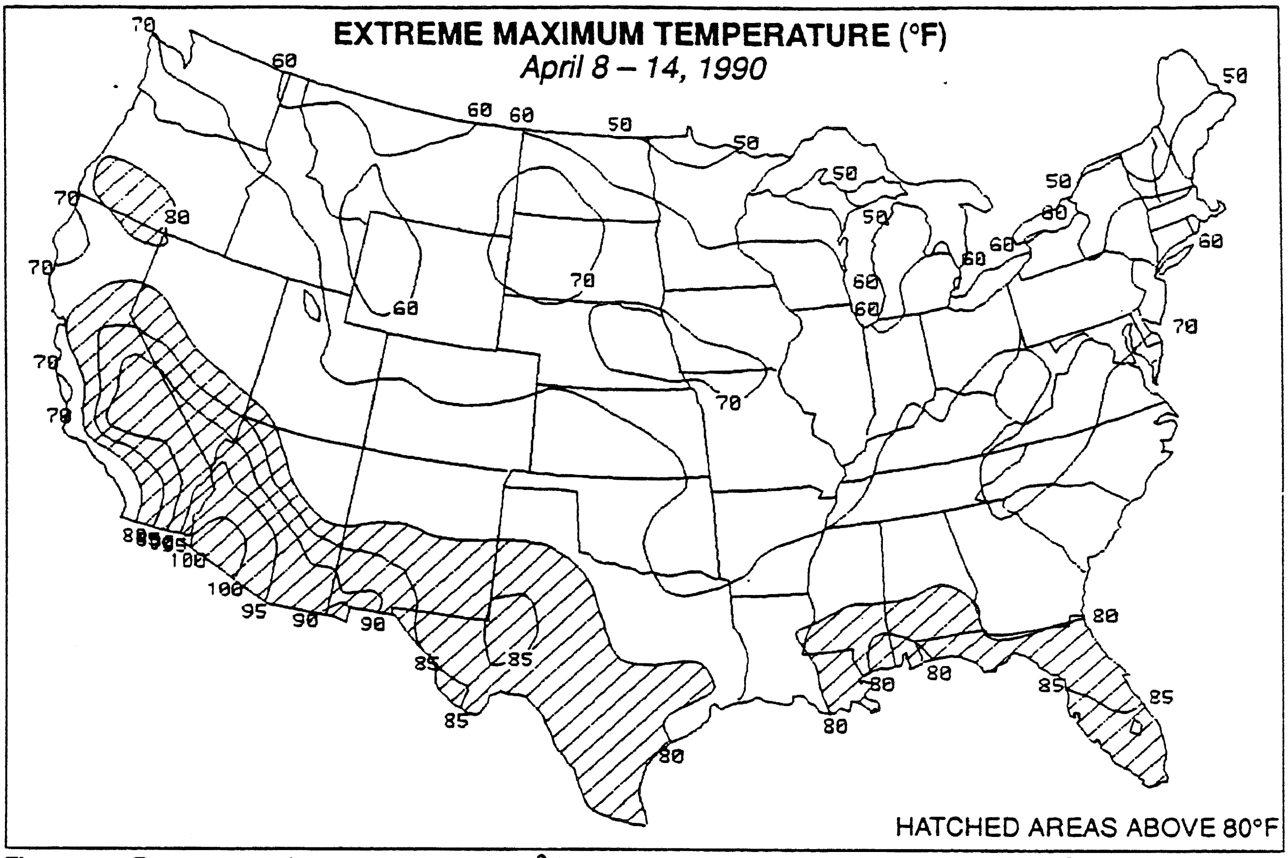


Figure 1. Extreme maximum temperatures (°F) during the week of April 8-14, 1990. Shaded areas are above 80°F, and isotherms are drawn for every 10°F starting at 50°F and for every 5°F starting at 85°F. Unseasonable warmth prevailed throughout the Far West as highs topped 90°F across much of the desert Southwest and surpassed 80°F as far north as southern Oregon. In contrast, cool conditions covered most of the eastern half of the country as readings failed to break 70°F in the northeastern quarter of the nation.

TABLE 2. Selected stations with temperatures averaging 9.0°F or more ABOVE normal for the week.

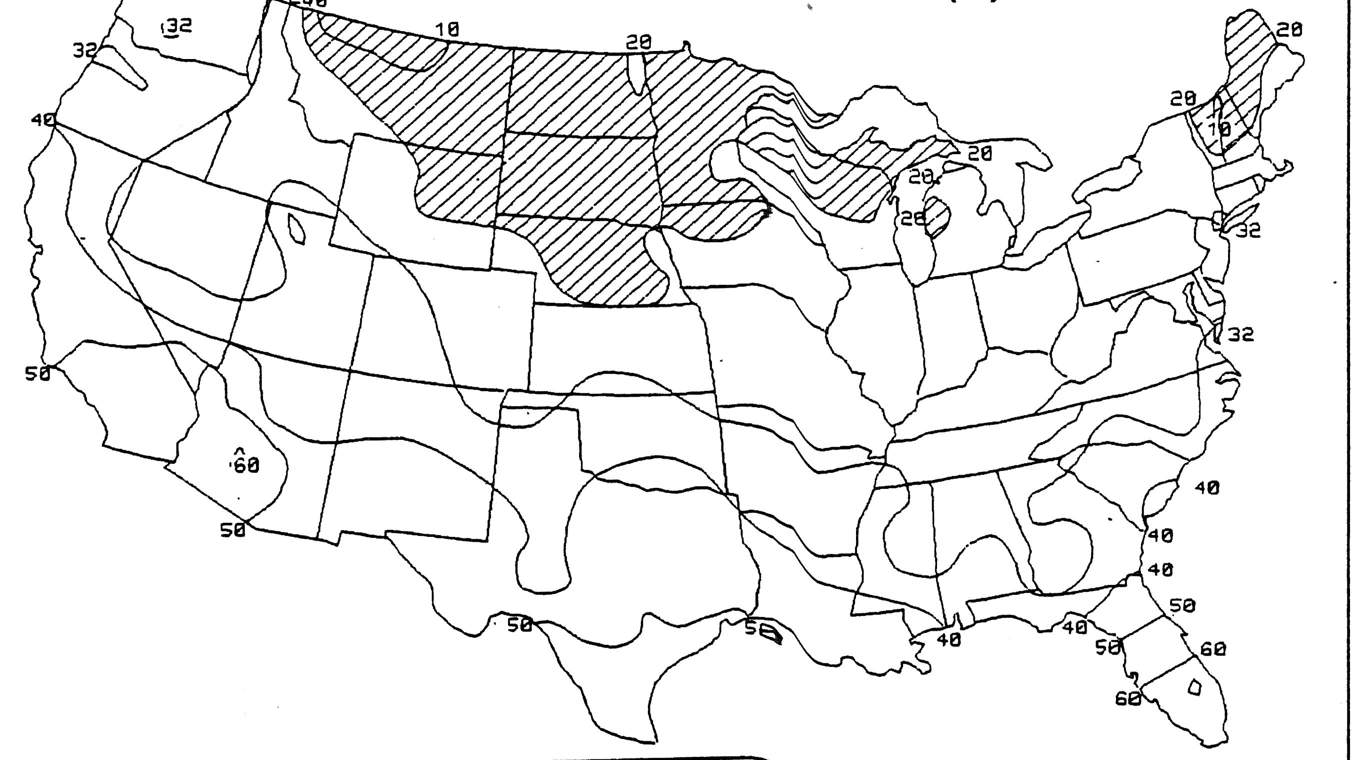
STATION	DEPARTURE (°F)	AVERAGE (°F)	STATION	DEPARTURE (°F)	AVERAGE (°F)
BARTER ISLAND, AK	+24.5	20.6	ILIAMNA, AK	+10.0	39.2
BARROW, AK	+20.8	16.3	BURLEY, ID	+9.7	54.0
BETHEL, AK	+13.6	34.8	BETTLES, AK	+9.6	28.6
NOME, AK	+13.0	28.3	LAS VEGAS, NV	+9.4	71.4
BLUE CANYON, CA	+12.6	54.8	SAN BERNADINO/NORTON AFB, CA	+9.4	69.1
MCGRATH, AK	+12.3	36.6	LOVELOCK, NV	+9.4	56.4
PHOENIX, AZ	+12.1	78.8	TONOPAH, NV	+9.4	55.5
RENO, NV	+12.1	57.4	MEDFORD, OR	+9.2	58.5
SEXTON SUMMIT, OR	+11.5	52.5	REDMOND, OR	+9.2	51.6
VICTORVILLE/GEORGE AFB, CA	+11.1	67.8	IDAHO FALLS, ID	+9.2	50.7
ANIAK, AK	+10.8	35.8	YUMA, AZ	+9.1	78.7
GLENDALE/LUKE AFB, AZ	+10.4	76.7	FRESNO, CA	+9.1	68.1
WINNEMUCCA, NV	+10.4	54.4	CEDAR CITY, UT	+9.1	54.6
RED BLUFF, CA	+10.1	67.7	PRESCOTT, AZ	+9.0	57.3
FAIRBANKS, AK	+10.1	37.4	BURNS, OR	+9.0	50.9

3. Selected stations with temperatures averaging 7.0°F or more BELOW normal for the week.

	DEPARTURE (°F)	AVERAGE (°F)	STATION	DEPARTURE (°F)	AVERAGE (°F)
	-8.5	49.5	KANSAS CITY/INTL., MO	-7.3	46.9
	-8.4	49.3	HICKORY, NC	-7.3	49.8
	-8.3	46.4	GOLDSBORO/JOHNSON AFB, NC	-7.3	52.6
	-8.3	46.7	DAYTON, OH	-7.2	42.7
	-8.2	46.7	LEXINGTON, KY	-7.2	46.4
	-8.2	51.2	INDIANAPOLIS, IN	-7.1	43.5
	-7.9	49.1	LOUISVILLE/STANDIFORD, KY	-7.1	48.1
	-7.8	48.9	BOWLING GREEN, KY	-7.1	48.8
	-7.8	56.4	JACKSON, KY	-7.1	52.7
		47.6	MONTGOMERY, AL	-7.1	57.0
		44.5	TOPEKA, KS	-7.0	46.1
		45.2	MUSCLE SHOALS, AL	-7.0	53.2
		47.4	JACKSON, MS	-7.0	56.7
MACON/WARNER-ROBINS AFB, GA	-7.5	57.0	BILOXI/KEESLER AFB, MS	-7.0	59.5
COLUMBIA, MO	-7.3	46.5			

EXTREME MINIMUM TEMPERATURE (°F)

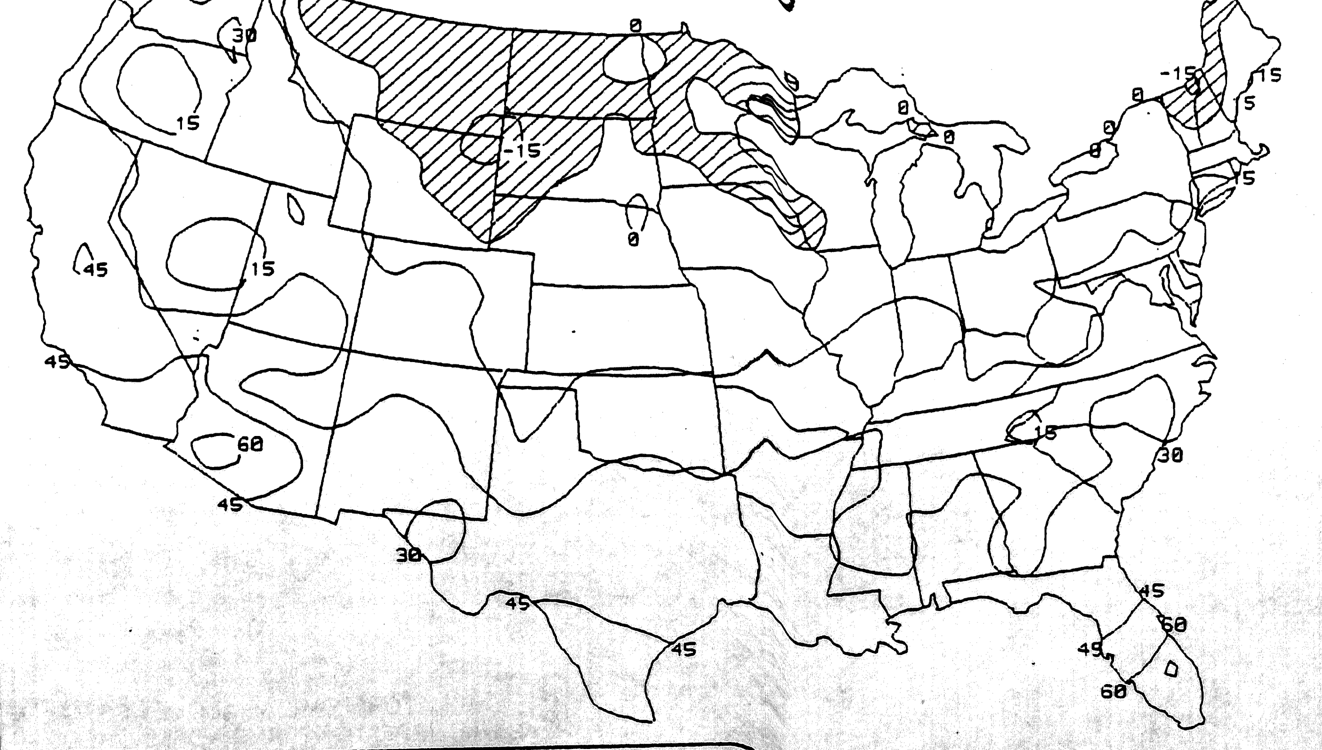
April 8 – 14, 1990

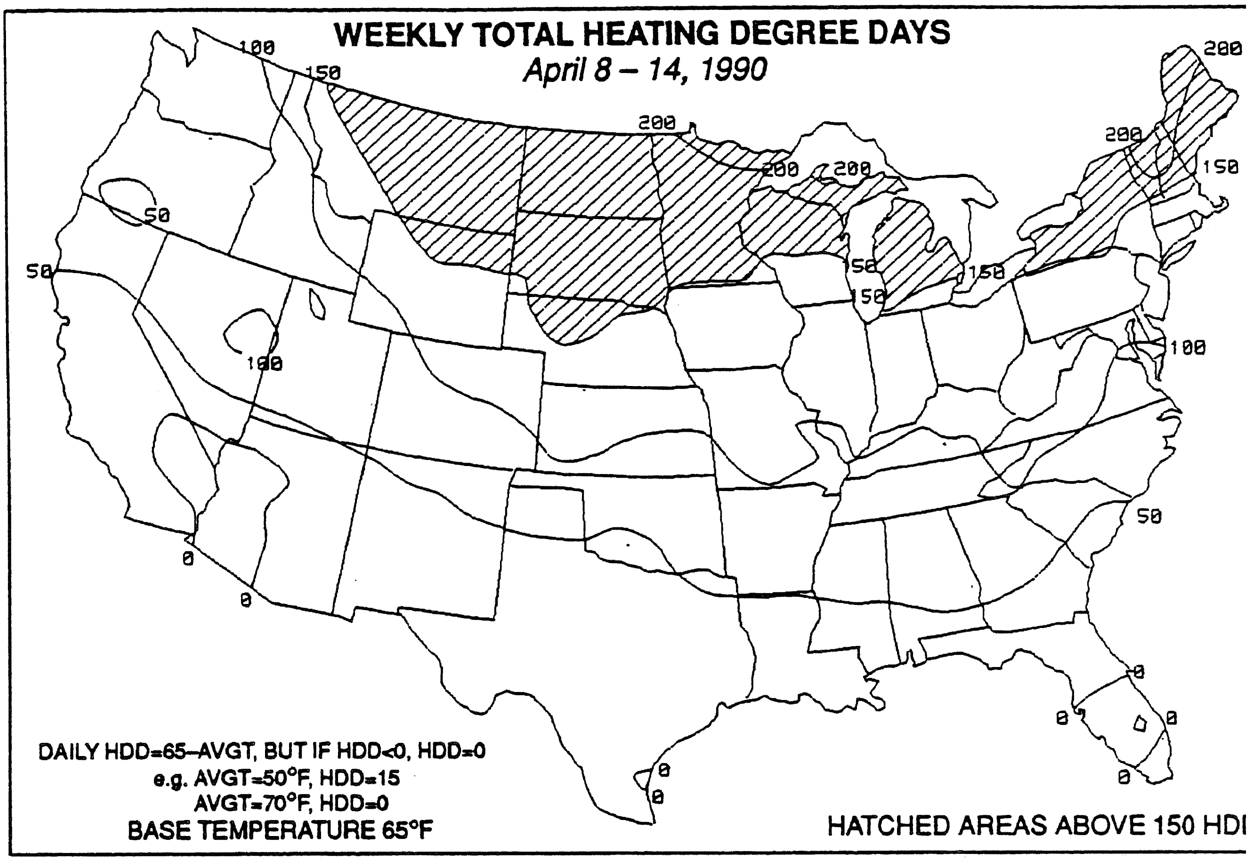


Two separate invasions of cold Canadian air into the central and eastern U.S. brought sub–freezing temperatures as far south as southern Georgia (top). Gusty winds accompanied the chilly intrusion across the northern and central Plains, Great Lakes, and Northeast, generating wind chills in the teens or lower throughout these areas (bottom).

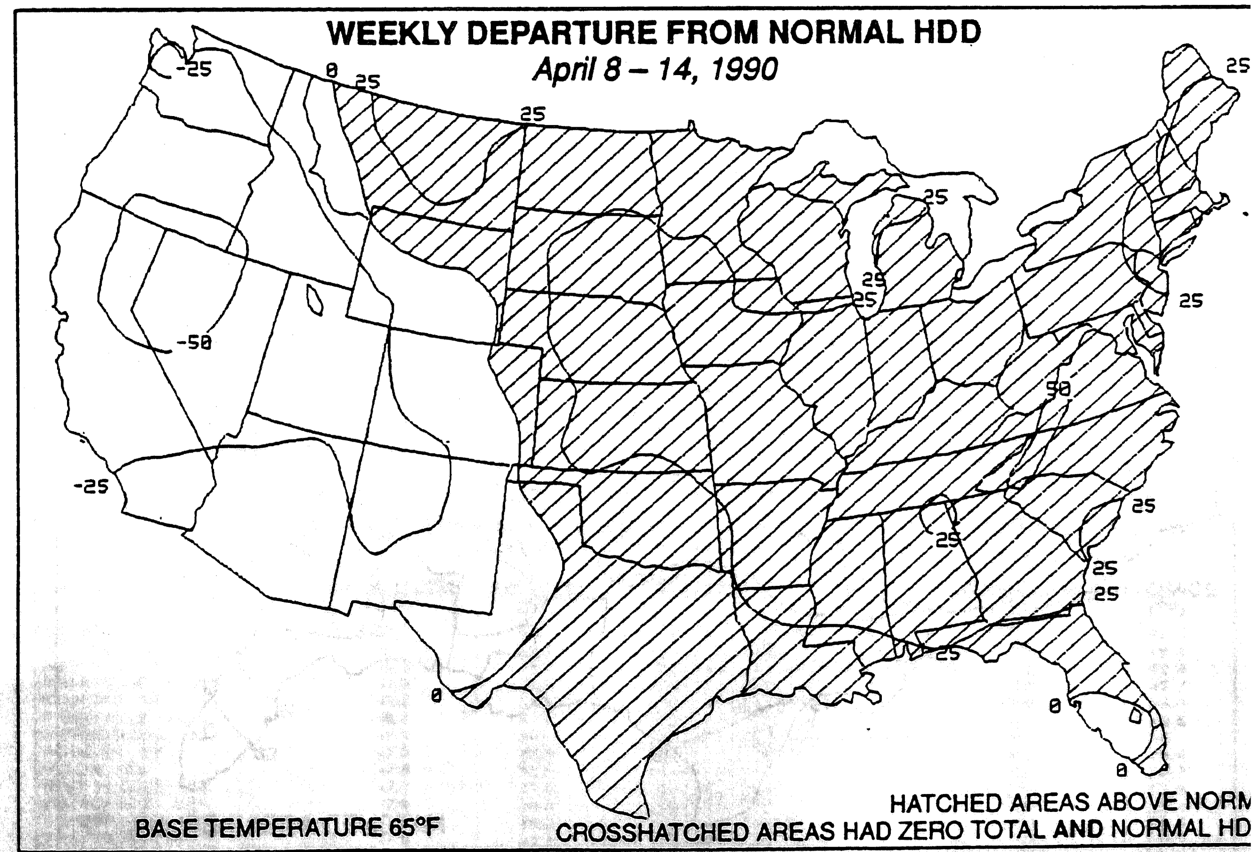
MINIMUM WIND CHILL (°F)

April 8 – 14, 1990





Entrenched cold air across the northern half of the nation east of the Rockies kept heating usage above 100 HI throughout the region (top) and generated above normal heating demand through the entire eastern two–thi of the nation, except in portions of southern Florida (bottom).



The Crop Moisture (Short–Term) Index

Palmer (1968) developed the Crop Moisture Index from moisture accounting procedures used in calculations of the Drought Severity Index to measure the degree to which moisture requirements of growing crops were met during the previous week. The Drought Severity Index evaluates prolonged meteorological dry or wet periods. The Crop Moisture Index gives the status of purely agricultural drought or moisture surplus affecting warm–season crops and field activities and can rapidly change from week to week. Calculations are made for 344 climatic divisions in the United States using weekly average temperatures and precipitation totals as input.

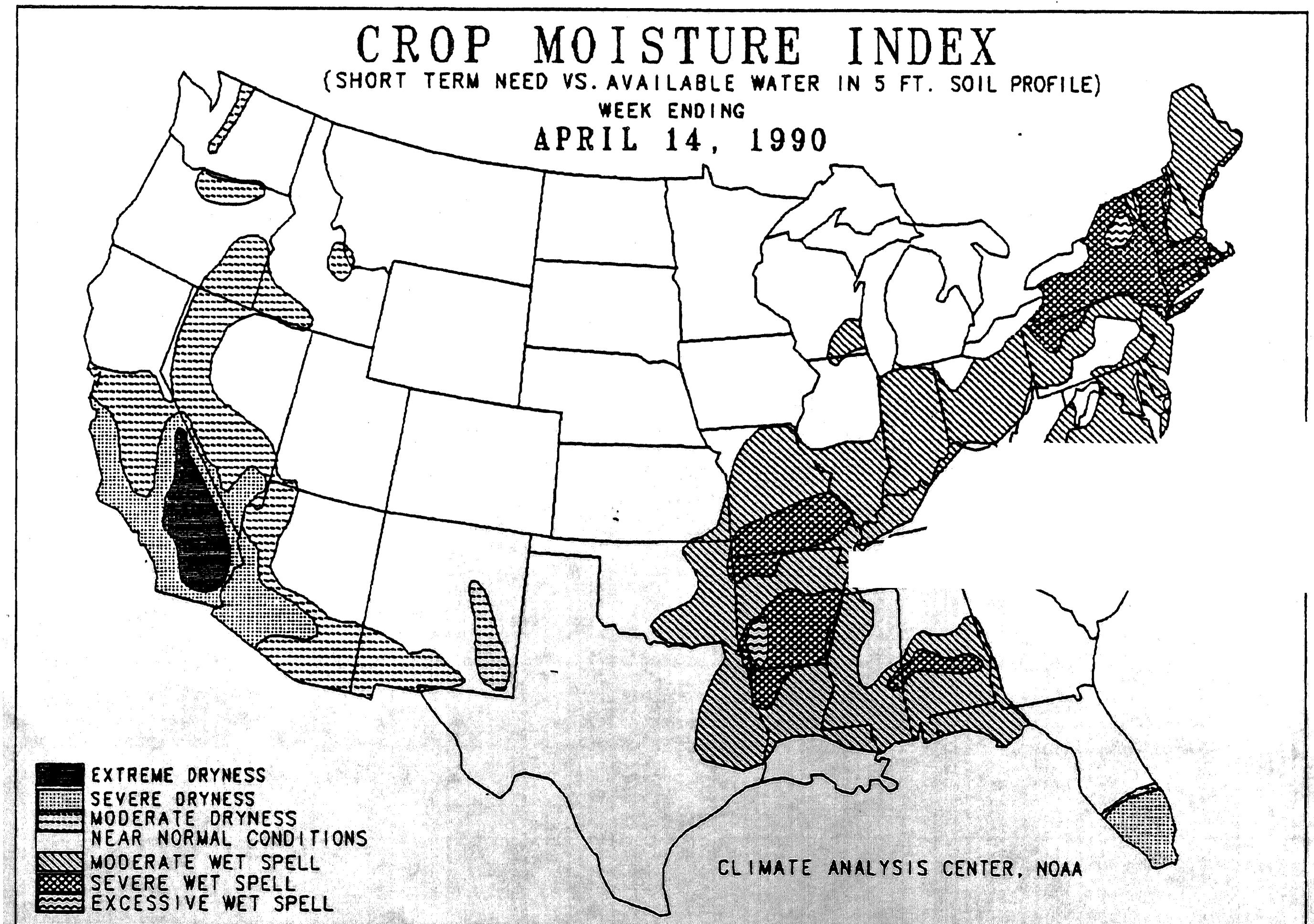
The index is the sum of the evapotranspiration anomaly, which is negative or slightly positive, and the moisture excess (either zero or positive). Both terms take into account the value of the previous week. The evapotranspiration anomaly is weighted to make it comparable for different locations and time of year. If the potential moisture demand exceeds available moisture supplies, the index is negative. If moisture meets or exceeds demand, the index is positive. It is necessary to use two separate interpretations because the resulting effects are different when the moisture supply is improving than when it is deteriorating.

General conditions are indicated and not local variations caused by isolated rains. The stage of crop development and soil type should also be considered in using this index. In irrigated regions, only departures from ordinary irrigation requirements are reflected. The index may not be applicable for seed germination, for shallow–rooted crops which are unable to extract the deep or subsoil moisture from a five foot profile, or for cool–season crops growing when temperatures are averaging below 55°F.

Above +3.0	Severely Wet/Extreme Wet Spell
+2.0 to +3.0	Moderately Wet/Severe Wet Spell
+1.0 to +2.0	Abnormally Moist/Moderate Wet Spell
+1.0 to –1.0	Near Normal Conditions
–1.0 to –2.0	Abnormally Dry/Moderate Dryness
–2.0 to –3.0	Moderately Dry/Severe Dryness
Below –3.0	Severely Dry/Extreme Dryness

Palmer, W. C., 1968: Keeping Track of crop moisture conditions nationwide: the new Crop Moisture Index. Weatherwise, 21, pp. 156–161.

Note: Article taken from the *Weekly Weather and Crop Bulletin* dated April 29, 1986.



The Drought Severity (Long–Term, Palmer) Index

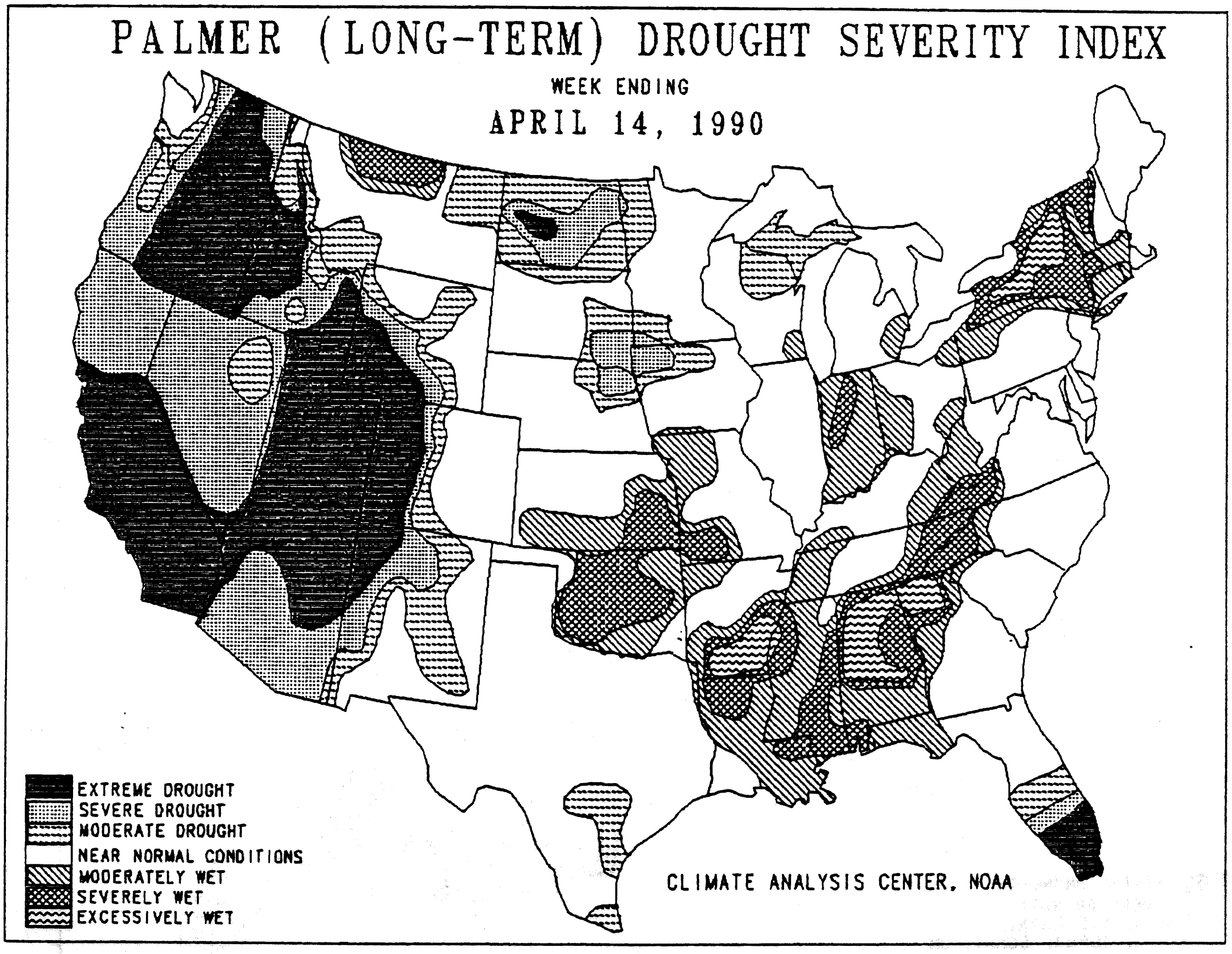
The Drought Severity, or Palmer, Index is an index of meteorological drought (or moisture excess) and indicates prolonged abnormal conditions affecting water–sensitive economics. The index usually ranges from –6 to +6, with negative values denoting dry spells and positive values indicating wet spells of weather (categories of values are given below). The equations for the index were derived from monthly average data and based on the concept of a balance between moisture supply and demand (Palmer, 1965). The equations have been modified to compute the index on a weekly basis. Input data consists of weekly temperature averages and precipitation totals for 344 climate divisions in the contiguous United States.

Above +4.0 Extreme Moist Spell	Below –4.0 Extreme Drought
+3.0 to +3.9 Very Moist Spell	–3.0 to –3.9 Severe Drought
+2.0 to +2.9 Unusual Moist Spell	–2.0 to –2.9 Moderate Drought
+1.0 to +1.9 Moist Spell	–1.0 to –1.9 Mild Drought
+0.5 to +0.9 Incipient Moist Spell	–0.4 to –0.9 Incipient Drought

+0.4 to –0.4 Near Normal

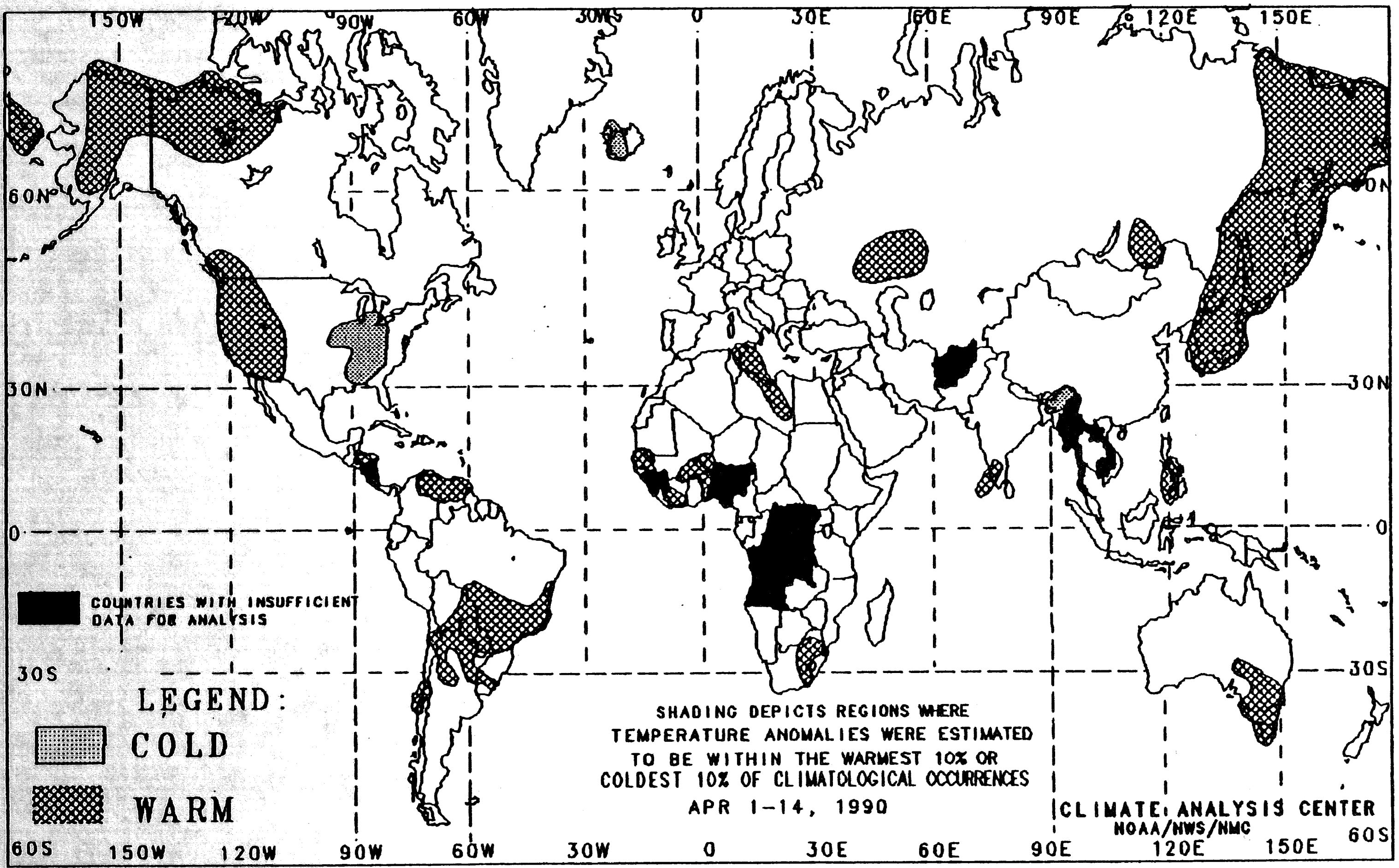
Palmer, W. C., Meteorological Drought, Weather Bureau Research Paper No. 45, U. S. Department of Commerce, Washington, D. C., February 1965, 58 pp.

Note: Article taken from the *Weekly Weather and Crop Bulletin* dated April 21, 1987.



GLOBAL TEMPERATURE ANOMALIES

2 WEEKS

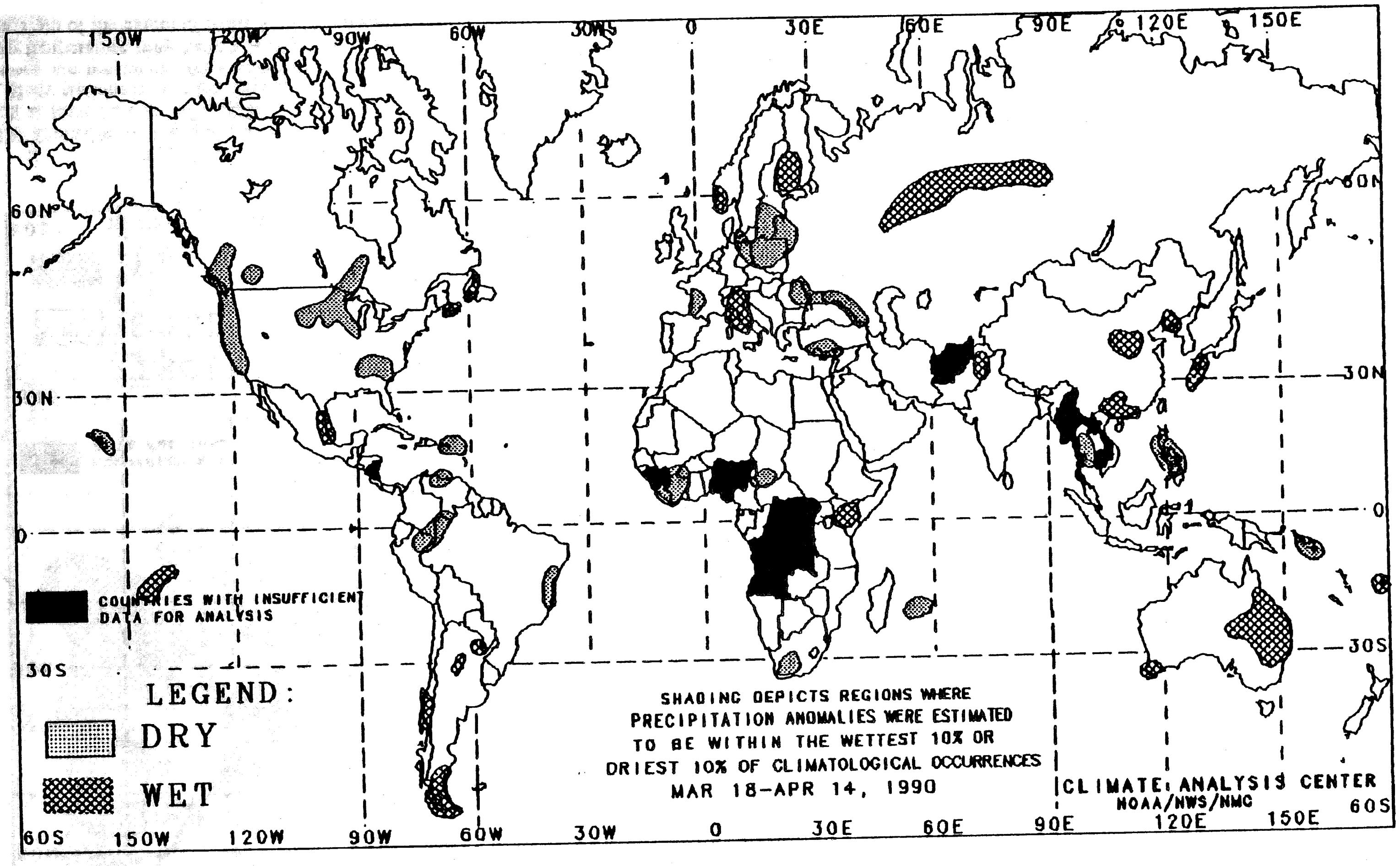


The anomalies on this chart are based on approximately 2500 observing stations for which at least 13 days of temperature observations were received from synoptic reports. Many stations do not operate on a twenty-four hour basis so many night time observations are not taken. As a result of these missing observations the estimated minimum temperature may have a warm bias. This in turn may have resulted in an

he magnitude of temperature

In some regions, insufficient data exist to determine the magnitude of anomalies. These regions are located in parts of tropical Africa, southwestern Asia, interior equatorial South America, and along the Arctic Coast. Either current data are too sparse or incomplete for analysis, or historical data are insufficient for determining percentiles, or both. No attempt has been made to estimate the magnitude of anomalies in such regions.

This chart shows general areas of two week temperature anomalies. Caution must be used in relating it to local conditions, especially in mountainous regions.



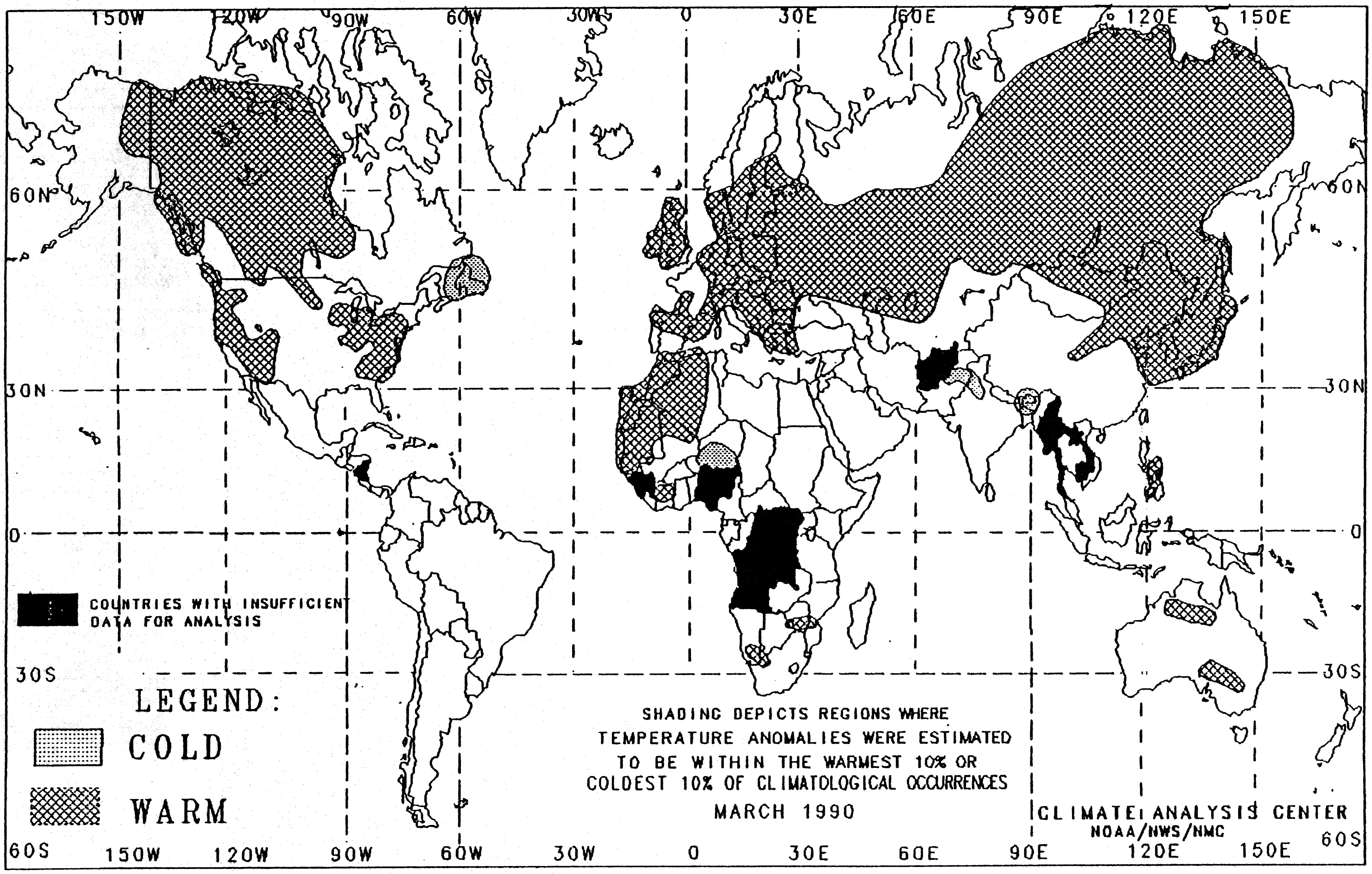
The anomalies on this chart are based on approximately 2500 observing stations for which at least 27 days of precipitation observations (including zero amounts) were received or estimated from synoptic reports. As a result of both missing observations and the use of estimates from synoptic reports (which are conservative), a dry bias in the total precipitation amount may exist for some stations used in this analysis. This in turn may have resulted in an overestimation of the extent of some dry anomalies.

In climatologically arid regions where normal precipitation for the four week period is less than 20 mm, dry anomalies are not depicted. Additionally, wet anomalies for such arid regions are not depicted unless the total four week precipitation exceeds 50 mm.

In some regions, insufficient data exist to determine the magnitude of anomalies. These regions are located in parts of tropical Africa, southwestern Asia, interior equatorial South America, and along the Arctic Coast. Either current data are too sparse or incomplete for analysis, or historical data are insufficient for determining percentiles, or both. No attempt has been made to estimate the magnitude of anomalies in such regions.

The chart shows general areas of four week precipitation anomalies. Caution must be used in relating it to local conditions, especially in mountainous regions.

MARCH 1990



The anomalies on this chart are based on approximately 2500 observing stations for which at least 26 days of temperature observations were received from synoptic reports. Many stations do not operate on a twenty-four hour basis so many night time observations are not taken. As a result of these missing observations the estimated minimum temperature may have a warm bias. This in turn may have reulted in an overestimation of the extent of some warm anomalies.

Temperature anomalies are not depicted unless the magnitude of temperature departures from normal exceeds 1.5°C.

In some regions, insufficient data exist to determine the magnitude of anomalies. These regions are located in parts of tropical Africa, southwestern Asia, interior equatorial South America, and along the Arctic Coast. Either current data are too sparse or incomplete for analysis, or historical data are insufficient for determining percentiles, or both. No attempt has been made to estimate the magnitude of anomalies in such regions.

The chart shows general areas of one month temperature anomalies. Caution must be used in relating it to local conditions, especially in mountainous regions.

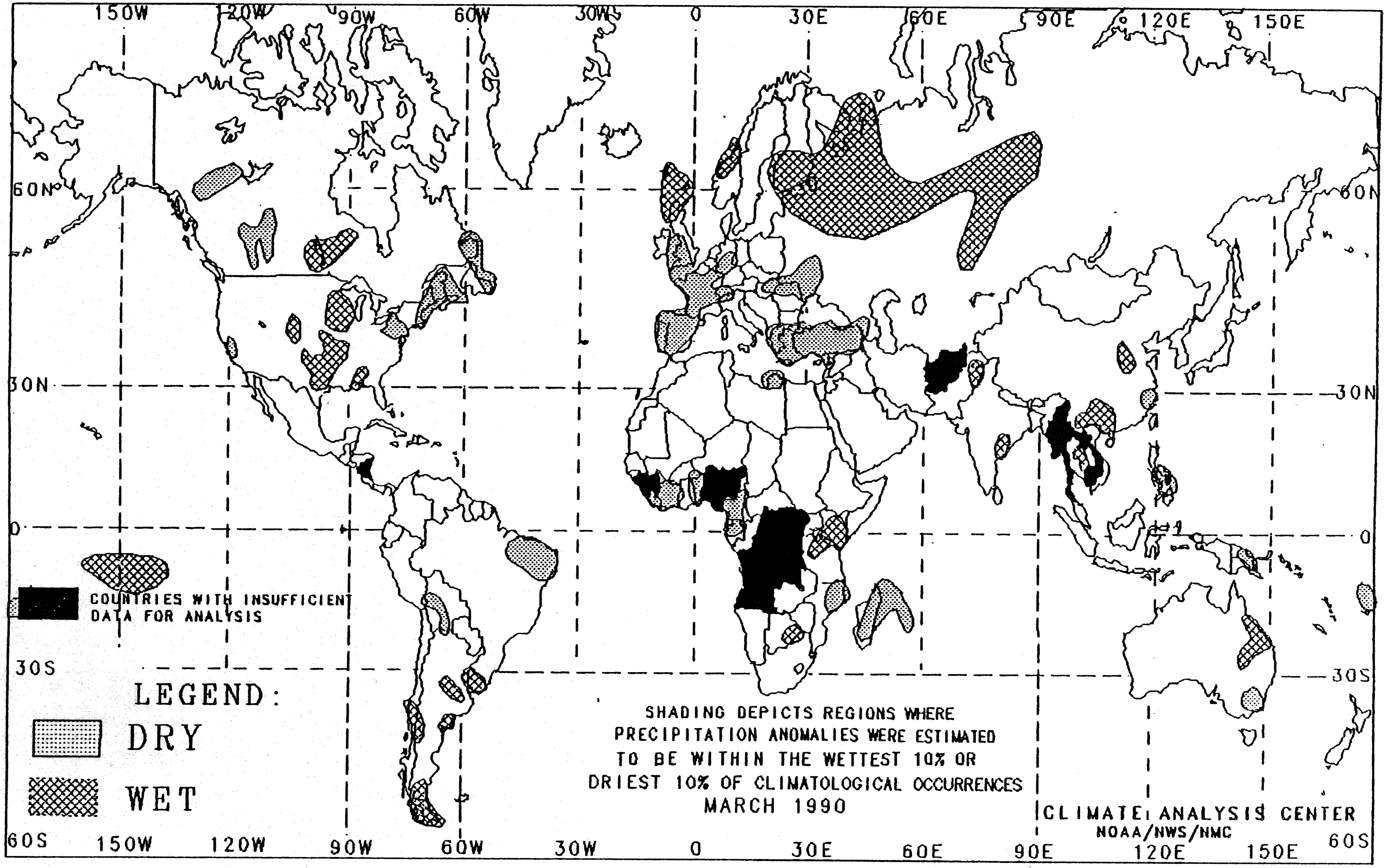
PRINCIPAL TEMPERATURE ANOMALIES

MARCH 1990

REGIONS AFFECTED	TEMPERATURE AVERAGE (°C)	DEPARTURE FROM NORMAL (°C)	COMMENTS
NORTH AMERICA			
Alaska, Canada, and North Central United States	−28 to +7	+2 to +3	MILD – 4 to 8 weeks
Maritime Provinces	−9 to −5	−2 to −6	Very cold early and late in March
Western United States	+6 to +20	+2 to +4	WARM – 2 to 6 weeks
Eastern United States	+3 to +17	+2 to +4	Very warm first half of March
SOUTH AMERICA AND EASTERN PACIFIC			
No Significant Anomalies			
EUROPE AND THE MIDDLE EAST			
British Isles	+6 to +9	+2 to +3	MILD – 4 to 27 weeks
Continental Europe	−7 to +14	+2 to +7	MILD – 5 to 27 weeks
AFRICA			
Northwestern Africa	+16 to +32	+2 to +4	WARM – 2 to 11 weeks
Ivory Coast	+28 to +29	Around +2	Very warm second half of March
Niger	+24 to +27	Around −3	COOL – 6 weeks
Southeastern Namibia and Northwestern South Africa	Around +26	Around +2	Very warm second half of March
Zimbabwe	+22 to +26	+2 to +4	Very warm second half of March
ASIA			
Northern and Eastern Asia	−27 to +13	+2 to +13	MILD – 4 to 27 weeks
Central Pakistan and Northern India	+11 to +21	−2 to −3	Very cool second half of Marc
Extreme Eastern India	Around +21	Around −2	Very cool early and late in March
AUSTRALIA AND WESTERN PACIFIC			
Philippines	Around +29	Around +2	WARM – 8 weeks
Northern Australia	Around +31	+2 to +3	Very warm second half of march
Southeastern Australia	+25 to +28	+2 to +4	Very cool second half of march

GLOBAL PRECIPITATION ANOMALIES

MARCH 1990



The anomalies on this chart are based on approximately 2500 observing stations for which at least 27 days of precipitation observations (including zero amounts) were received or estimated from synoptic reports. As a result of both missing observations and the use of estimates from synoptic reports (which are conservative), a dry bias in the total precipitation amount may exist for some stations used in this analysis. This in turn may have resulted in an overestimation of the extent of some dry anomalies.

In climatologically arid regions where normal precipitation for the one month period is less than 20 mm, dry anomalies are not depicted. Additionally, wet anomalies for such arid regions are not depicted unless the total one month precipitation exceeds 50 mm.

In some regions, insufficient data exist to determine the magnitude of anomalies. These regions are located in parts of tropical Africa, southwestern Asia, interior equatorial South America, and along the Arctic Coast. Either current data are too sparse or incomplete for analysis, or historical data are insufficient for determining percentiles, or both. No attempt has been made to estimate the magnitude of anomalies in such regions.

The chart shows general areas of one month precipitation anomalies. Caution must be used in relating it to local conditions, especially in mountainous regions.

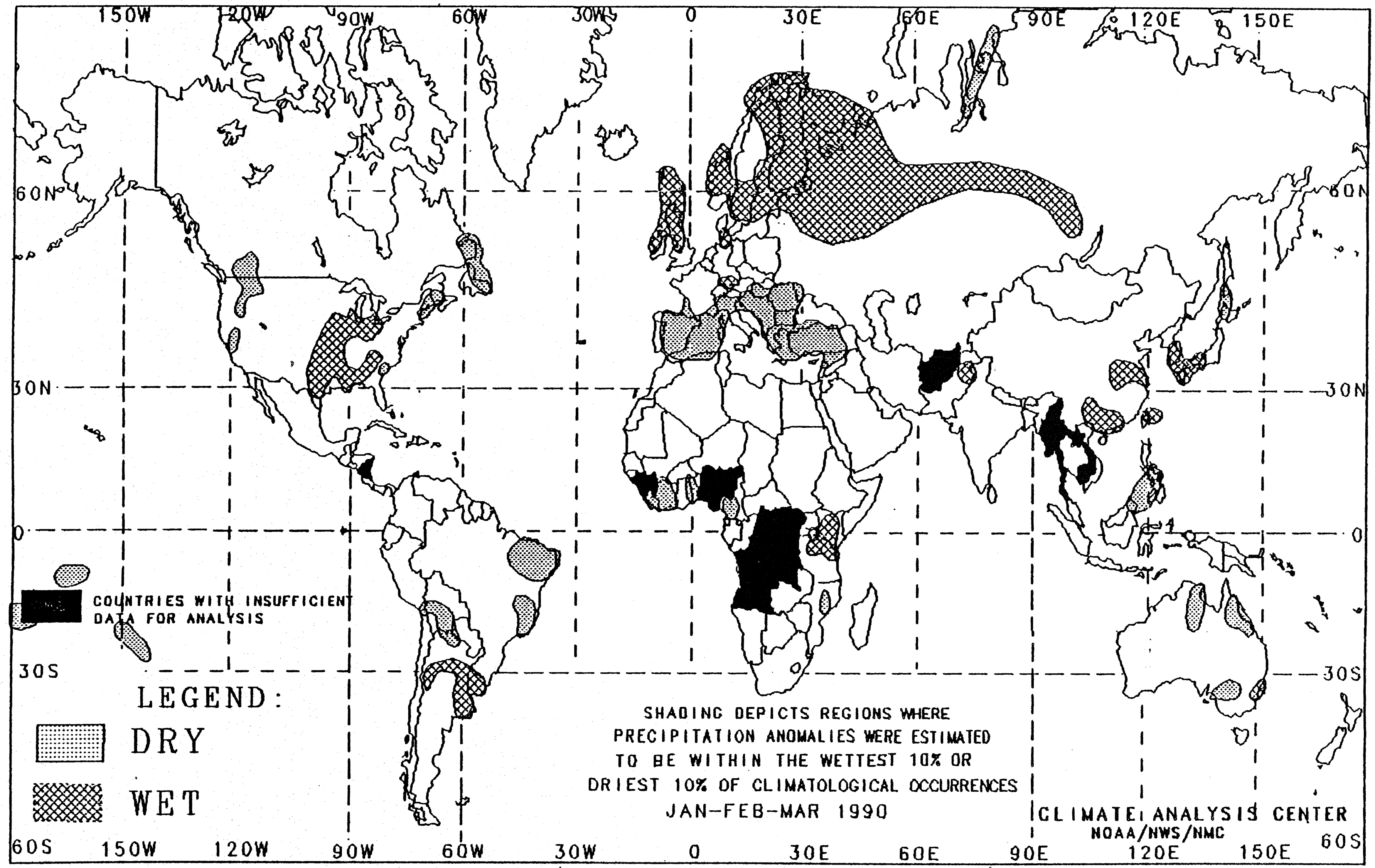
PRINCIPAL PRECIPITATION ANOMALIES

MARCH 1990

REGIONS AFFECTED	PRECIPITATION TOTAL (MM)	PERCENT OF NORMAL	COMMENTS
NORTH AMERICA			
Northwestern Canada	Around 1	3 to 4	DRY – 6 weeks
Southwestern Canada	0 to 7	0 to 35	DRY – 6 weeks
South Central Canada	42 to 54	192 to 202	Heavy precipitation first half of March
North Central United States	79 to 170	197 to 267	Heavy precipitation first half of March
Northeastern United States	22 to 44	29 to 51	DRY – 4 to 8 weeks
New England and Maritime Provinces	27 to 69	36 to 54	DRY – 5 to 7 weeks
Newfoundland	0 to 55	0 to 42	DRY – 4 weeks
Central California	4 to 22	9 to 42	DRY – 4 weeks
Wyoming and Colorado	79 to 93	261 to 377	Heavy precipitation first half of March
South Central United States	62 to 256	208 to 393	Heavy precipitation first half of March
Alabama	311 to 315	189 to 210	WET – 5 weeks
SOUTH AMERICA AND EASTERN PACIFIC			
Fiji Islands	73 to 152	20 to 39	DRY – 6 weeks
French Polynesia	211 to 357	198 to 282	Heavy precipitation second half of March
Extreme Eastern Brazil	9 to 27	5 to 11	DRY – 4 to 5 weeks
Bolivia	15 to 29	15 to 26	DRY – 6 to 9 weeks
Uruguay	203 to 360	204 to 271	WET – 5 to 13 weeks
North Central Argentina	188 to 329	170 to 212	WET – 4 weeks
West Central Argentina and Central Chile	64 to 124	260 to 467	Heavy precipitation second half of March
East Central Argentina	88 to 104	301 to 312	Heavy precipitation first half of March
Extreme Southern Argentina and Extreme Southern Chile	56 to 91	182 to 559	Heavy precipitation second half of March
EUROPE AND THE MIDDLE EAST			
Scotland and Faroe Islands	156 to 206	174 to 256	WET – 4 weeks
Central Norway	58 to 327	244 to 485	Heavy precipitation second half of March
Finland and Northwestern Soviet Union	41 to 75	182 to 565	WET – 5 to 13 weeks
Southwestern Europe	2 to 27	5 to 53	DRY – 6 to 27 weeks
Hungary, Romania, and Ukrainian S.S.R.	0 to 7	0 to 39	DRY – 6 to 23 weeks
Greece and Turkey	0 to 19	0 to 34	DRY – 4 to 27 weeks
AFRICA			
North Central Libya	0 to 1	0 to 1	DRY – 8 weeks
Ivory Coast, Liberia, and Guinea	0 to 31	0 to 27	DRY – 5 to 7 weeks
Togo and Benin	0 to 23	0 to 25	DRY – 5 to 6 weeks
Cameroon and Gabon	1 to 98	3 to 45	DRY – 4 to 6 weeks
Kenya and Tanzania	163 to 467	244 to 423	Heavy precipitation first half of March
Botswana	102 to 137	217 to 258	WET – 5 weeks
Mozambique	15 to 55	7 to 30	DRY – 5 weeks
Madagascar Island and Off-Shore Indian Ocean Islands	27 to 146	14 to 32	DRY – 5 to 6 weeks
ASIA			
Northern India and Eastern Pakistan	95 to 235	225 to 354	Heavy precipitation second half of March
East Central India	52 to 60	355 to 766	Heavy precipitation first half of March
North Central China	55 to 96	358 to 530	Heavy precipitation second half of March
East Central China	45 to 89	36 to 49	DRY – 4 to 5 weeks
South Central China	52 to 327	230 to 525	Heavy precipitation first half of March
Thailand	117 to 192	299 to 352	Heavy precipitation first half of March
AUSTRALIA AND WESTERN PACIFIC			
Philippines	28 to 39	19 to 21	DRY – 4 to 10 weeks
Papua New Guinea	158 to 171	47 to 48	DRY – 5 weeks
Northeastern Australia	162 to 312	269 to 320	Heavy precipitation early and late in March
Southeastern Australia	6 to 7	12 to 19	DRY – 8 weeks

GLOBAL PRECIPITATION ANOMALIES

JANUARY 1990 – MARCH 1990

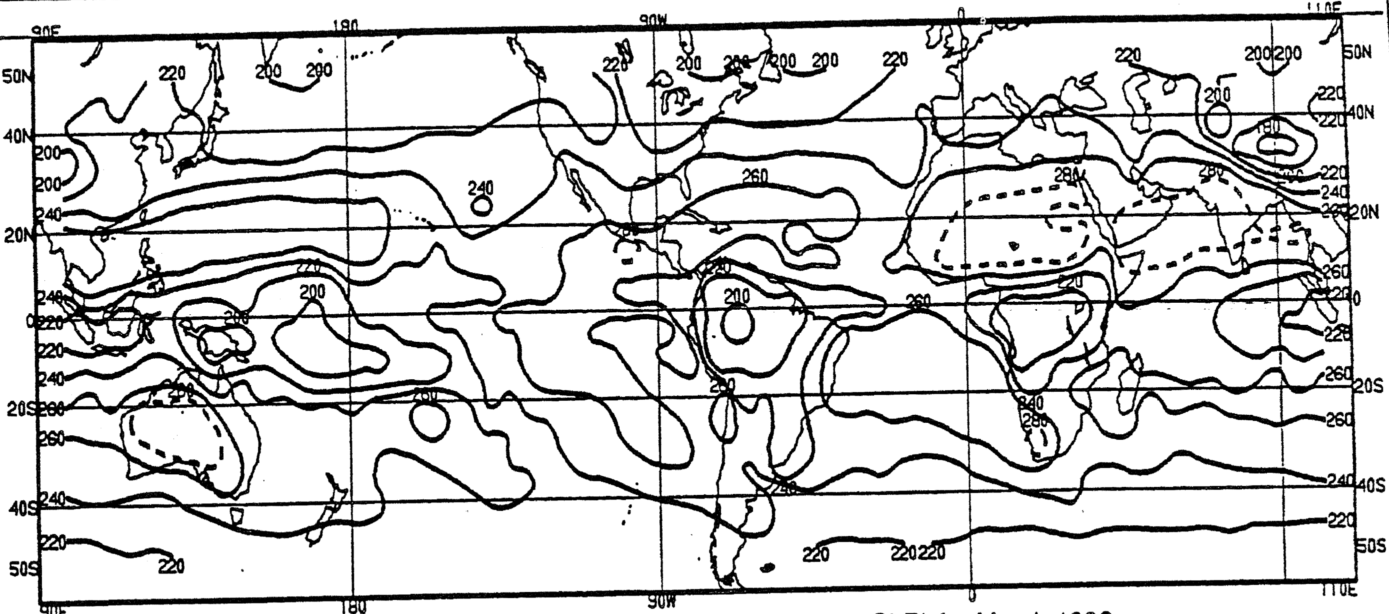


The anomalies on this chart are based on approximately 2500 observing stations for which at least 81 days of precipitation observations (including zero amounts) were received or estimated from synoptic reports. As a result of both missing observations and the use of estimates from synoptic reports (which are conservative), a dry bias in the total precipitation amount may exist for some stations used in this analysis. This in turn may have resulted in an overestimation of the extent of some dry anomalies.

In climatologically arid regions where normal precipitation for the three month period is less than 50 mm, dry anomalies are not depicted. Additionally, wet anomalies for such arid regions are not depicted unless the total three month precipitation exceeds 125 mm.

In some regions, insufficient data exist to determine the magnitude of anomalies. These regions are located in parts of tropical Africa, southwestern Asia, interior equatorial South America, and along the Arctic Coast. Either current data are too sparse or incomplete for analysis, or historical data are insufficient for determining percentiles, or both. No attempt has been made to estimate the magnitude of anomalies in such regions.

The chart shows general areas of three month precipitation anomalies. Caution must be used in relating it to local conditions, especially in mountainous regions.

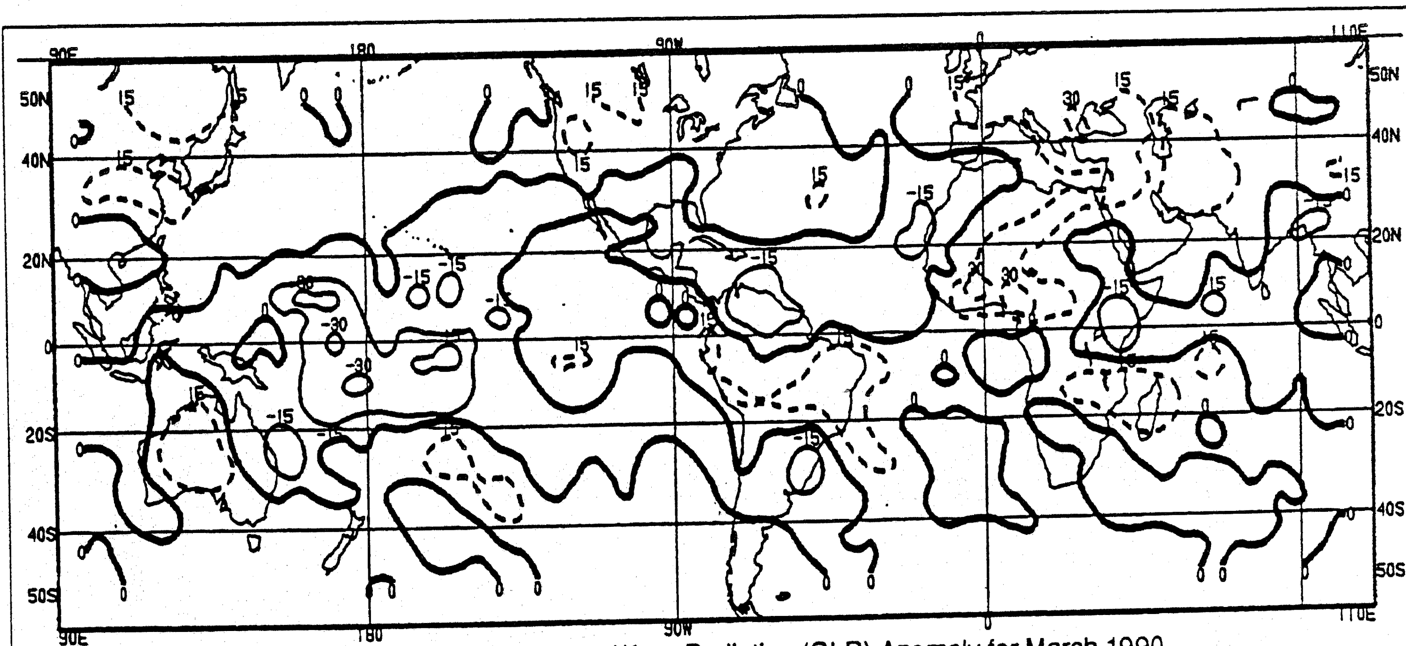


Monthly Mean Outgoing Long Wave Radiation (OLR) for March 1990

EXPLANATION

The mean monthly outgoing long wave radiation (OLR) as measured by the NOAA–9 AVHRR IR window channel by NESDIS/SRL (top). Data are accumulated and averaged over 2.5° areas to a 5° Mercator grid for display. Contour intervals are 20 Wm^{-2}, and contours of 280 Wm^{-2} and above are dashed. In tropical areas (for our purposes 20°N – 20°S) that receive primarily convective rainfall, a mean OLR value of less than 200 Wm^{-2} is associated with significant monthly precipitation, whereas a value greater than 260 Wm^{-2} normally indicates little or no precipitation. Care must be used in interpreting this chart at higher latitudes, where much of the precipitation is non–convective, or in some tropical coastal or island locations, where precipitation is primarily orographically induced. The approximate relationship between mean OLR and precipitation amount does not necessarily hold in such locations.

The mean monthly outgoing long wave radiation anomalies (bottom) are computed as departures from the 1979 – 1988 base period mean. Contour intervals are 15 Wm^{-2}, while positive anomalies (greater than normal OLR, suggesting less than normal cloud cover and/or precipitation) are dashed and negative anomalies (less than normal OLR, suggesting greater than normal cloud cover and/or precipitation) are solid.



Monthly Mean Outgoing Long Wave Radiation (OLR) Anomaly for March 1990

SPECIAL CLIMATE SUMMARY

EL NIÑO SOUTHERN OSCILLATION (ENSO) DIAGNOSTIC ADVISORY 90/3

issued by

DIAGNOSTICS BRANCH
THE CLIMATE ANALYSIS CENTER
NATIONAL METEOROLOGICAL CENTER, NWS

April 18, 1990

Warm episode conditions continued in the central and western equatorial Pacific. Highly anomalous atmospheric circulation and convective patterns, which began to develop during November 1989, persisted in the equatorial western and central Pacific in March 1990. The Southern Oscillation Index (SOI) was strongly negative for the second consecutive month, and the five–month running mean of this index dropped to –1 (see Figure 1). During the last 20 years, the five–month running mean average of the SOI dropped below –1 only during warm (ENSO) episodes.

Low–level westerly anomalies continued in the western equatorial Pacific, as enhanced convection persisted in the central Pacific (see Figure 2). In the eastern equatorial Pacific, however, weak easterly anomalies were observed.

Positive sea surface temperature (SST) anomalies were rather modest throughout the equatorial Pacific with values reaching +1 °C along the equator near the date line and near 10°N from 120°W to 160°W (see Figure 3). Conditions in the eastern equatorial Pacific, however, remained near normal. This pattern of anomalies is similar to that observed during the early stages of the 1986–1987 warm episode.

Strong intraseasonal variability continued to characterize many regions in the tropics associated with vigorous Madden–Julian (30–60 day) oscillations. During March, enhanced convection once again shifted eastward from the region of Indonesia and the eastern Indian Ocean to the central equatorial Pacific. Low–level westerly anomalies followed in the wake of this convective activity. Since December 1989, the period of the intraseasonal oscillations has been about 45 days, with the latest oscillation being somewhat weaker and having a shorter period than the oscillation of January–February 1990. At the end of March, convective activity was weakening in the central Pacific and intensifying in the Indian Ocean sector, which is similar to what occurred in mid–February.

The intraseasonal oscillations have dominated the variability in the tropics during the last six months. Even so, the trend appears to be towards enhanced convection in the central Pacific and weaker than normal convection over Indonesia. Similarly, the data have pointed to a reversal in the low–level zonal wind anomaly pattern in the central and western equatorial Pacific between August–September 1989 and during the most recent months. These changes in the patterns of anomalous convection and low–level zonal winds are characteristic of warm (ENSO) episodes.

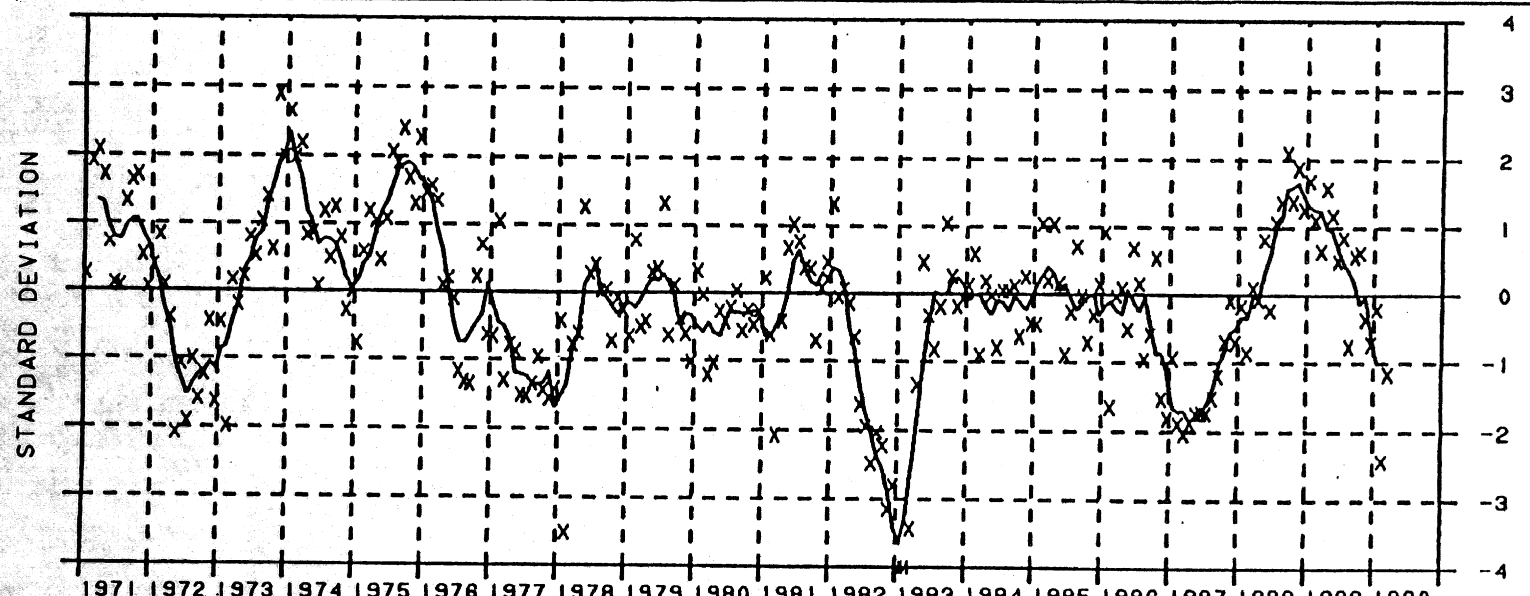


Figure 1. Five-month running mean of the difference between the standardized sea level pressure anomalies at Tahiti and Darwin (Tahiti-Darwin). Values are standardized by the mean annual standard deviation. Crosses are individual monthly means. Anomalously high March sea level pressure in northern Australia and Indonesia, along with unusually low March sea-level pressure in the central Pacific, produced a strongly negative Southern Oscillation Index (SOI) for the second successive month. In addition, this month marked the first time since the 1986-1987 ENSO that the five-month running mean average of the SOI fell below -1.0. During the last 20 years, the five-month running mean average of the SOI has dropped below -1 only during warm (ENSO) episodes.

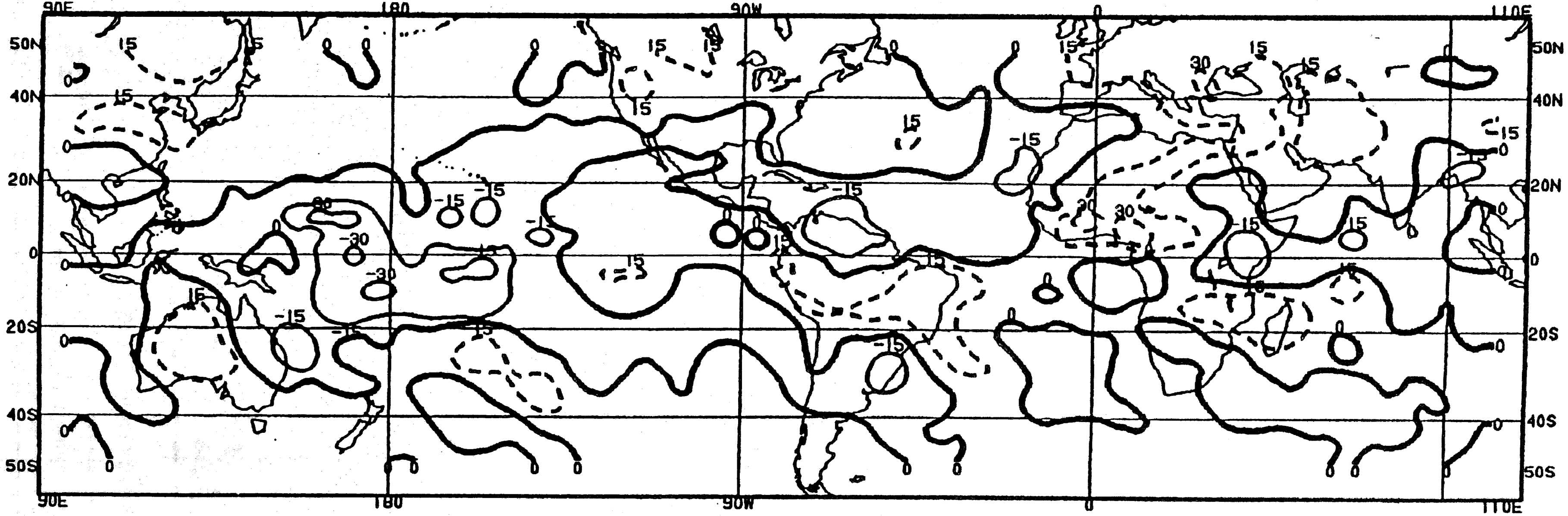


Figure 2. Anomalous outgoing longwave radiation for March 1990, obtained from the NOAA-11 AVHRR IR window channel measurements by NESDIS/SRL, and are valid only in equatorial areas (between 20°N and 20°S). Anomalies are computed as departures from the 1979-1988 base period mean. Contour interval is 15 Wm-2. Positive anomalies are indicated by dashed contours (more OLR than normal, or less cloudiness (precipitation)), and negative anomalies are solid contours (less OLR than normal, or more cloudiness (precipitation)). Enhanced convection continued in the central Pacific during March, but only weak anomalies were observed in the eastern equatorial Pacific.

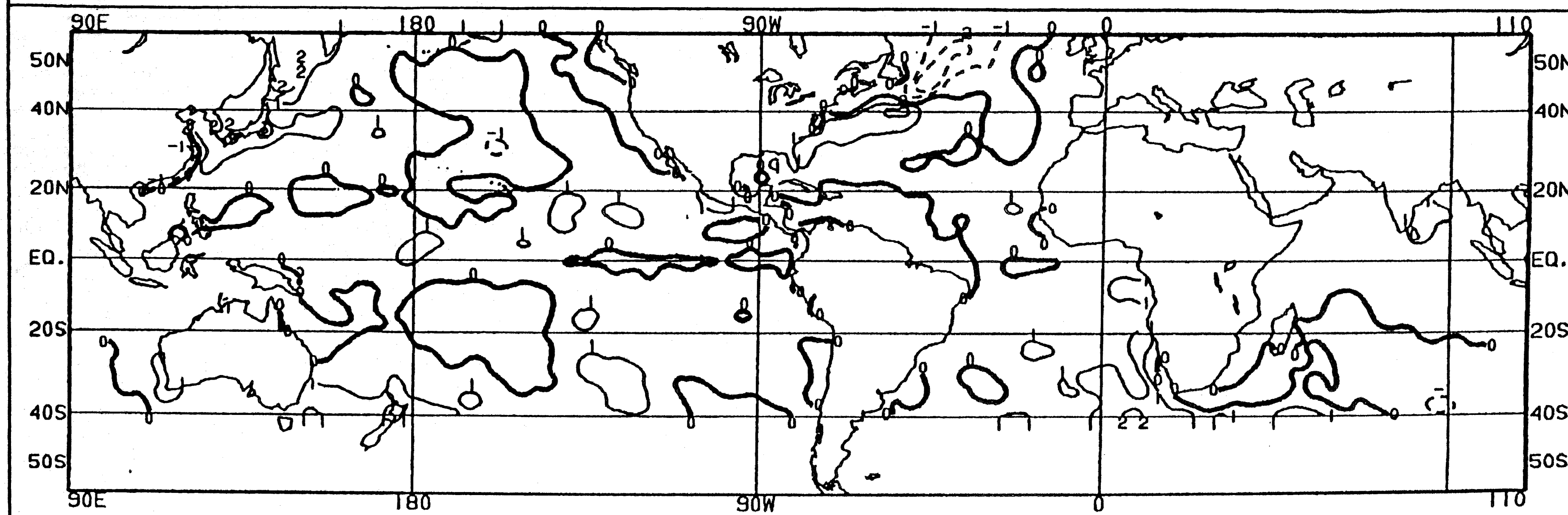


Figure 3. Anomalous sea surface temperatures (SST) for March 1990. Anomalies are computed as departures from the COADS/ICE climatology (Reynolds, 1988, J. Climate, 1, 75-86). Contour interval is 1°C with negative values (below normal SST) indicated by dashed contours. Positive SST anomalies were rather modest throughout the equatorial Pacific, with values reaching 1°C along the equator near the date line and near 10°N from 120°W to 160°W. Conditions in the eastern equatorial Pacific, however, remained near normal.